lowest, 6°, at Webster on the 24th. The average precipitation was 1.87, or 0.82 above normal; the greatest monthly amount, 7.45, occurred at Tyndall, and the least, "trace," at Fort Meade and Nowlin.

Tennessee.—The mean temperature was 57.5°, or about normal; the highest was 88°, at Benton on the 8th, and the lowest, 27°, at St. Joseph on the 18th, and at Bristol on the 24th. The average precipitation was 1.54, or about 0.75 below normal; the greatest monthly amount, 3.56, occurred at Brownsville, and the least, 0.51, at Rugby.

Texas.—Report delayed.

Utah.—The mean temperature was 51.0°, or slightly above normal; the highest was 94°, at St. George on the 2d, and the lowest, 13°, at Giles on the 27th. The average precipitation was 0.61, or about one-half the normal; the greatest monthly amount, 1.53, occurred at Scipio, and the least, 0.10, at Mammoth.

Virginia.—The mean temperature was 54.7°, or 2.7° below normal; the highest was 85°, occurring at several stations on several dates; the lowest was 21°, at Stanardsville on the 19th. The average precipitation was 0.95, or 2.22 below normal; the greatest monthly amount, 2.90, occurred at Birdsnest, and the least, "trace," at Guinea.

Washington.—The mean temperature was 50.0°, or 0.2° below normal; the highest was 88°, at Centerville on the 18th, and the lowest, 18°, at Cascade Tunnel on the 8th. The average precipitation was 2.59, or 0.36 below normal; the greatest monthly amount, 7.88, occurred at Queets, and the least, 0.03, at Fort Simcoe.

West Virginia.—The mean temperature was 50.8°, or about 3.0° below normal; the highest was 82°, at Morgantown on the 29th, and the lowest, 20°, at White Sulphur Springs on the 19th, and at Marlington and Philippi on the 25th. The average precipitation was 2.08, or about 1.00 below normal; the greatest monthly amount, 4.37, occurred at Weston, and the least, 0.45, at Old Fields.

Wisconsin.—The mean temperature was 44.1°, or about 2.0° below normal; the highest was 78°, at Appollonia on the 1st, and the lowest, 4°, at City Point on the 22d. The most notable feature of the month was the almost total lack of precipitation, until the 28th, and the excessive precipitation of the last three days, which brought the monthly average nearly to the normal amount for the month. The greatest amount, 4.22, occurred at Grantsburg, and the least, 0.12, at Menasha.

Wyoming.—The mean temperature was 44.8°, or 1.0° below normal; the highest was 89°, at Wheatland on the 5th, and the lowest, 10°, at Fort Laramie on the 24th, Lander on the 29th, and Fort Washakie on the 30th. The average precipitation was 0.50, or 0.26 below normal; the greatest monthly amount, 0.87, occurred at Lusk, and the least, 0.12, at Wheatland.

DELAYED SEPTEMBER REPORT.

Arizona.—The mean temperature was 77.6°, or 4.0° above normal; the highest was 1.12°, at Parker on the 16th, and the lowest, 35°, at Whipple on the 24th. The average precipitation was 1.87, or 0.67 above normal; the greatest monthly amount, 4.62, occurred at Allaires Ranch, Cochise County, while no rain fell at San Simon in the same county.

SPECIAL CONTRIBUTIONS.

THE INTERNATIONAL METEOROLOGICAL CONFERENCE AT PARIS, SEPTEMBER, 1896.

By A. LAWRENCE ROTCH (dated Nov. 14, 1896).

This Conference, which was held in Paris between the 17th and 23d of September, 1896, was similar in character to that which met in 1891 at Munich, that is, it was composed of invited representatives from the principal meteorological services and observatories of the world. The following gentlemen attended the meeting: MM. Angot, Paris; Anguiano, Mexico; Baillaud, Toulouse; von Bezold, Prussia; Biese, Finland; Billwiller, Switzerland; Ellis, Greenwich; Erk, Bavaria; Fines, Perpignan; Hepites, Roumania; Hergesell, Alsace-Lorraine; Hildebrandsson, Sweden; Jaubert, Paris; Kesslitz, Pola; Konkoly, Hungary; Lancaster, Belgium; Mascart, France; Mohn, Norway; Moureaux, Parc Saint Maur; Neumayer, Germany; Paulsen, Denmark; Riggenbach, Bale; van Rijckevorsel, Netherlands; Rotch, Harvard and Blue Hill observatories; Rykatcheff, Russia; Scott, Great Britain; Schmidt, Stuttgart; Snellen, Netherlands; Stupart, Canada; Symons, London; Tacchini, Italy; Teisserenc de Bort, Paris; Thévenet, Algeria; Watzoff, Bulgaria; Wragge, Queensland, Australia. The following guests were admitted to the meeting as specialists: MM. Dufour, Lausanne; Page, United States Hydrographic Office, Washington; Tolnay, Budapest; Rücker, London; Becquerel, Fron, Chauveau, Mathias, and de Fonvielle, Paris.

Officers of the meeting were chosen as follows: President, M. Mascart; Vice Presidents, MM. von Bezold and Tacchini; Secretaries, MM. Scott, Erk, and Angot. The language of the Conference was French, but communications in German and English were allowed. Mr. Scott, Secretary of the Permanent International Committee, read a report of the work which had been done since its meeting at Upsala. The provisional programme of questions proposed for the meeting was then taken up and subcommittees were appointed to consider the questions relating to international telegraphy, instruments and methods of observation, cloud observations, terrestrial magnetism and atmospheric electricity, and to report to the Conference. It was the opinion of the Conference that decisions of former meetings should not be reconsidered, and that there should be no interference with government work. Several questions were excluded as beyond the province of the Conference; others were referred to future meetings, among them being the proposition of Prof. Bigelow to adopt the solar magnetic period, and the question left over from the Munich Conference as to the best methods of extending observations and meteorological publications in the interest of agriculture. No report on this subject had been received from the committee appointed at Munich, but the Chief of the United States Weather Bureau sent for distribution specimens of the agricultural bulletins and weather predictions issued in different sections of the United States.

In this account of the proceedings the questions which were not definitely acted upon are not mentioned.

Mr. Symons' proposition of double stations, left over from the Munich Conference, was finally settled thus:

It is desirable that at one station, at least, in each country, there should be used simultaneously with the ordinary thermometer shelter, such other arrangements as the Stevenson screen and the French screen, and at least the Assmann aspiration thermometer (large size) of the present construction (Fuess, 1896). Comparisons should be continued during two years, and if the results can not be published *in extenso* the means and extremes should at least be given for each month. It is also considered very important that a uniform model of shelter be adopted in each country, and that a complete description with drawings and dimensions be published, so that it can be reproduced exactly anywhere.

Monthly charts were presented to the Conference by M. Paulsen indicating the floating ice in the Atlantic north of the sixtieth parallel, and the following resolution was adopted:

The Conference appreciates the high scientific value of the work undertaken by M. Paulsen. It expresses the wish that the institutions receiving reports from navigators in the northern seas above 60°, should send to M. Paulsen the observations which they may collect.

Mr. Wragge's proposal to establish stations on Mount Wellington (4,650 feet) in Tasmania, and on Mount Kosciusko (8,000 feet) at the southeast extremity of Australia, and to publish hourly observations was approved by the Conference.

The following proposition of Dr. Hann was adopted:

The directors of the meteorological services of the different countries are requested to give in their annals a list of the publications relating to meteorology and terrestrial magnetism appearing in their countries.

M. Hildebrandsson read a note on the necessity of creating

stations of observation around the great centers of action in the atmosphere, and the Conference, appreciating the high scientific value of the observations presented by M. Hildebrandsson, hoped that his desire might be realized.

M. Billwiller reported to the subcommittee on the proposition of the central offices at Hamburg and Utrecht relative to the acceleration of meteorological telegrams which had been submitted to the International Telegraphic Congress at Budapest.

The committee believes that the best means of establishing international relations between the different series would be to constitute a system of circular dispatches at a fixed hour between the central offices. Nevertheless, on account of the difficulties which this organization now presents it is desirable that the data relating to each country should be centralized at the various offices in time for the international exchanges to be made at the latest before 11 a. m., Greenwich time.

It was considered of interest to try the "circuit system" between neighboring countries, but it was not thought desirable to change the form of the dispatches or to fix the hours of observation in the various countries. The wish was expressed that the arrival of these dispatches at Paris be accelerated, particularly those from the Iberian Peninsula, which, although of great importance in certain situations, always arrive too late to be utilized. As regards the publication, the committee believed that the study of meteorological phenomena over a large territory requires the knowledge of practically simultaneous observations. The previous recommendation was recalled, that in each country hourly observations should be published by a certain number of principal stations, and it was further requested that the services publish regularly and with little delay the monthly means of observations made at the telegraphic stations.

M. Snellen read a note to the Conference on the use of Olland's telemeteorograph, which is in operation between Utrecht and Vlissingen (Flushing), and the Conference thought that its use might improve the forecasts.

Mr. Rotch's question as to recording thunderstorms was thus answered:

1. The symbol ┳ is to be added to the international symbols adopted by the Vienna Congress, to designate the days on which distant thunder has been heard.

And, in accordance with the Vienna decision:

2. The symbol ≤ is to be reserved for distant lightning and for diffuse lightning (Wetter Leuchten, sheet lightning).
3. The symbol ┳≤ is to indicate all cases when both lightning and thunder have been observed together.
4. In the summaries the number of days with thunderstorms will be, as far as possible, counted separately for each of these three cases.

As to the registration of the hours of sunshine, submitted by the Royal Meteorological Society, it was decided:

In the present state of science the duration of visibility should be the chief object; the problems of relative intensity ought to be made the object of special investigations. For general climatology it is necessary that the instrument should have such an exposure that the horizon is entirely visible. The duration of insolation should be referred to the apparent daily duration.

The International Committee was requested to name a special commission for the study of solar radiation.

Regarding the adoption of a standard anemometer and of a uniform exposure for anemometers:

The Conference considers it impossible at present to recommend any one instrument as a standard or any uniform mode of exposure for all stations.

The Royal Meteorological Society's question as to the uniformity of conditions for the measurement of soil temperatures was recommended for study and presentation to the next Conference.

M. Mohn read a paper on the use of the hypsometer as a substitute for the barometer, as a control instrument for the latter knowing the force of gravity, and as a method of determining the gravity correction by simultaneous observations of the hypsometer and of the mercurial barometer.

M. Billwiller presented a report on the necessity of adopting a uniform method of reducing barometer observations to sea level in the construction of synoptic charts, which was submitted to the directors of meteorological services.

At the reunion of the subcommittee on clouds, reports were presented by the representatives of the different countries, showing what was being done in response to the circular of the International Committee, asking for participation in the international scheme of cloud observation. It appeared that measurements with theodolites or photo-theodolites (photogrammeters) were now being made at one or more stations in Norway and Sweden, Russia, France, Prussia, United States, and Canada, as well as Batavia and at Manila. It is expected that such measurements will be instituted in Hungary, at two stations in India, and at two stations at Sydney, Australia. In addition to these measurements, nephoscopic observations of the direction and apparent velocity of clouds are being made in Norway and Sweden, Denmark, Russia, France, Belgium, Prussia, Pola (Austria), Bucharest (Roumania), Switzerland, Hohenheim (Wurtemberg), Strassburg (Alsace-Lorraine), Holland and United States. Such a station will also be established at Victoria (British Columbia). The following resolution was adopted:

It is desirable that the direct observations of clouds be continued at the secondary stations until the close of the year 1897, in order that there may be available, in any case, a synoptic series embracing one year. It is also desirable that the central offices should continue their measurements, when it is possible, until that time.

The Conference accepted the Cloud Atlas published by MM. Hildebrandsson, Riggenbach, and Teisserenc de Bort of the International Cloud Committee, and the following persons were afterward appointed by the International Committee as a new Cloud Committee: MM. Hildebrandsson, Riggenbach, Rykatcheff, Teisserenc de Bort, Sprung, Mohn, and Rotch.

Probably the most important work done at the Conference was in relation to terrestrial magnetism and atmospheric electricity. Reports were presented to the subcommittee showing the progress of the magnetic survey of Europe. M. von Bezold and M. Eschenhagen, of Potsdam, proposed certain general principles for the publication of magnetic observations, and discussed the distribution of magnetic observatories over the globe. They likewise proposed certain general principles for the construction of magnetic charts in each country. Some of these propositions were adopted, some were adopted after modification, and others referred to a special commission to be nominated by the International Committee. Other resolutions were as follows:

The Conference considers it desirable to take steps to organize, at fixed epochs, simultaneous observations of declination and horizontal force, especially by photographic methods, more rapid and sensitive than the ordinary recorders. The use of similar instruments is preferable.

It is important to develop the study of earth currents. This investigation, like that of magnetic phenomena, should only be undertaken in the open country, distant from the industrial electric installations.

The Conference recommends the development of the methods of studying atmospheric electricity by self-recording instruments.

Members of the Conference who are interested in meteorological aeronautics proposed the following resolutions which were adopted by the general assembly:

1. The Conference recognizes the great importance of aeronautical investigations for meteorological science and expresses the desire that scientific ascensions should be encouraged and multiplied.
2. The Conference expresses the wish that scientific ascents, either with manned balloons or with pilot balloons, should take place simultaneously at the different stations.
3. At the present time the Conference can not recommend either special methods or particular instruments, but it desires that, so far as

possible, identical instruments should be used during the simultaneous ascensions of pilot balloons.

4. The prompt publication of the unreduced observations, especially those which are made in simultaneous ascensions, is of capital importance.

5. It is desirable that observations in captive balloons, which are not manned, should be systematically made.

6. On account of the satisfactory results which have been attained at Blue Hill with kites carrying registering instruments up to 2,000 meters, it is desirable that similar investigations be undertaken elsewhere.

A provisional aeronautical committee was nominated afterwards by the International Committee to further these resolutions, consisting of MM. Hergesell, Erk, and Assmann, of Germany; Cailletet, de Fonvielle, Hermite, and Jaubert, of France; Pormatzoff, of Russia, and Rotch, of the United States.

On the demand of M. Snellen—

The Conference requests the International Committee to convoke a reunion of the directors of those institutions that are interested in maritime meteorology, in order to establish uniformity in methods of observation and publication, and it desires that a report on this question be presented to the next Conference.

M. Mohn announced that Dr. Nansen had collected between latitudes 81° and 86° three entire years of meteorological observations made every four hours, and comprising also the continuous registration of pressure and temperature, as well as magnetic and hydrological observations, etc. M. Mohn promised to do his best to reduce and to publish all these observations according to the methods adopted by the meteorological congresses and conferences.

It was decided that a new International Committee be constituted in the same manner and that it have the same functions as the former one. The former committee was reelected with the three vacancies filled as follows: Mr. Ellery, of Melbourne, was replaced by Mr. Russell, of Sydney; Mr. Harrington by Mr. Moore, the new director of the Weather Bureau; and M. Wild by M. Rykatcheff, his successor as director of the Russian Meteorological Service. The seventeen members of the committee are, therefore: MM. von Bezold, Germany; Billwiller, Switzerland; de Brito-Capello, Portugal; Davis, Argentine Republic; Eliot, India; Hann, Austria; Hepites, Roumania; Hildebrandsson, Sweden; Mascart, France; Mohn, Norway; Moore, United States; Paulsen, Denmark; Russell, New South Wales, Australia; Rykatcheff, Russia; Scott, Great Britain; Snellen, Netherlands; Tacchini, Italy. Authority was given to the committee to fill vacancies in its body and to replace its officers at a meeting called for the purpose. It was afterwards announced that M. Mascart had been chosen president, and that Mr. Scott would retain the office of secretary to the committee.

The French edition of the proceedings of the present Conference, with appendices, containing reports, etc., will be printed and distributed as soon as possible. Mr. Scott will bring out the English edition, and M. von Bezold the German edition. It was decided that the interval of five years adopted at Munich between it and the present Conference should determine the date of the next Conference which, accordingly, is to be held in 1901, at a place to be appointed by the Permanent International Committee.

THE INTERNATIONAL, HYDROLOGICAL, CLIMATOLOGICAL, AND GEOLOGICAL CONGRESS AT CLERMONT-FERRAND.

By A. LAWRENCE ROTCH (dated Nov. 20, 1896).

The fourth session of the Congress (in accordance with the decision of the Congress held at Rome in 1894) was held at Clermont-Ferrand, Department of the Puy de Dome, France, between September 28 and October 2, 1896. It was attended by about 200 persons, of whom much the greater number were French physicians. Twelve countries were represented, most of them by several delegates. Professor Proust, general inspector of sanitary services, who represented the Minister of Public Instruction, was the honorary president. The principal officers elected were: Dr. de Rause and Dr. Fredet, president and general secretary, respectively, of the committee of organization, who were confirmed in these offices for the meeting. The honorary vice president was Dr. Berthenson, of Russia, and the honorary vice presidents were: Professor Ludwig, of Austria, Professor Kuborn, of Belgium, and Mr. Rotch, of the United States. The presidents of the three sections into which the Congress was divided were French, and were as follows: Hydrology, Dr. Cazaux; climatology, Professor Hurion; geology, M. Levy. The latter section was first organized at this meeting.

Reports upon certain questions proposed by the organization committee served as a basis for subsequent discussions. The most important of these reports were: The controlling action and specialization of different mineral waters according to their therapeutic action, by Dr. Max. Durand-Fardel; carbonic acid and alkaline bicarbonates in mineral waters and their therapeutic action, by Dr. A. Labat; investigation of methods to determine the degree of purity and the color of the sky and their influence on hygiene, by Prof. A. Hurion; the role of meteorological observations in the study of climate, by M. A. Angot; conditions which affect the circulation of dusts in the atmosphere and the influence of these dusts on health, by M. J. R. Plumandon; the régime of winds in certain regions and their influence on the sanitary conditions, by Dr. de Valcourt; what is to be understood by high climates and what conditions should be fulfilled, with a statement of the chief therapeutic indications, by Dr. E. de la Harpe; influence of earthquakes on the régime of mineral waters, by Prof. P. Girod; the relation of deep artesian wells to certain mineral springs, by Prof. L. de Launay.

The other reports, and the majority of the papers presented, treated of the curative effect of special waters and climates, with the relative advantages of different stations, and of the development and exploitation of mineral sources. Professor Kuborn described the work in Belgium of the medical climatological and geological service of the Society of Public Medicine and a French climatological association was proposed by Dr. Piche, similar to that existing in southwest France, which has its central station at the Carlier Observatiry at Orthez.

There were several conferences of a more general interest; Dr. Labat spoke on the history of hydrology and Professor Velaine on the geology of the central plateau. The observatory on the Puy de Dome (4,800 feet) was the first of the French mountain stations for meteorology and was completed about 1873; the director, Professor Hurion, compared its climate with that of Clermont. During the Congress there was an exhibition of waters from neighboring thermal stations with models and drawings of the surroundings. The thermal establishment of Royat was visited, and after the Congress closed excursions were made to Vichy, Neris, La Borboule, Mont Dore, and Saint Nectaire.

At the closing meeting it was voted to hold the next session at Brussels in 1898. The proceedings of the present Congress will be published by a commission appointed by the committee of organization and will be distributed to the members.

HORIZONTAL ATMOSPHERIC ROLLS.

By FRANK W. PROCTOR (dated November 6, 1896).

On two occasions during the winter of 1895–96, the writer had the pleasure of observing at Waynesville, Heywood Co., N. C. (N. 35° 30′, W. 83° 0′), numerous horizontal atmospheric rolls which were made visible by clouds floating in the rolls. The circumstances were as follows:

About 7 o'clock a. m., the observer was looking to the south-